



NAVY EXPERIMENTAL DIVING UNIT

REPORT NO. 12-96

EVALUATION OF RIX INDUSTRIES
SA-6G DUAL BELT CONVERSION KIT
(UNMANNED)

GEORGE D. SULLIVAN
September 1996

NAVY EXPERIMENTAL DIVING UNIT



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NAVY EXPERIMENTAL DIVING UNIT

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INTRODUCTION

Navy Experimental Diving Unit (NEDU), was tasked¹ to evaluate the RIX Industries SA-6G Conversion Kit, part number 204-800. Testing was conducted² by EODMU 2 and 3 after receiving training at NEDU.

The purpose of this testing was:

1. Determine if the conversion kit could be correctly installed in the field by EOD technicians.
2. Determine the adequacy of the manufacturer's information, instructions and guidance for the safe installation of the conversion kit and subsequent operation of the compressor.
3. Ensure that the compressor system continues to run smoothly, and the pulleys stay in alignment and do not wander on their shafts.

EQUIPMENT DESCRIPTION

The RIX SA-6G compressor has a design problem that allows the pulley attached to the compressor to slide freely on the shaft if the set screw becomes loose. This problem has caused damage to both the belt covers and second stage tubing coils. RIX Industries has fabricated an SA-6G conversion kit that converts the single v-belt compressor to a dual belt configuration. Reported advantages are increased belt life, less compressor vibration, easier compressor pulley removal and replacement, and elimination of the counterweight on the pulley side of the compressor.

This test provided a series of procedures for evaluation of the RIX Industries SA-6G Conversion Kits. Data was compiled during the test to determine if the kit provides a reliable solution to the problem.

TEST PROCEDURE

GENERAL INFORMATION.

NEDU established liaison with NAVEODFLTLAU to determine two Mobile EOD units to act as test sites. Mobile Unit Two and Three were chosen. Personnel from both units were ordered TAD to NEDU for training. NEDU purchased two conversion kits from RIX industries. RIX provided one of their technical representatives to instruct the test personnel on the proper installation and alignment of the conversion kits.

NEDU conducted a receipt inspection of the conversion kits using the manufacturer's technical specifications³ to ensure all parts and material were received and on hand. EOD Mobile Unit Two brought a new SA-6 compressor to use for instruction purposes. Training

was conducted by the RIX representative to show EOD representatives the proper installation procedure for the kit. Once the kit was installed, an operational test was conducted and measurements taken to insure the pulleys did not move from their original position. This compressor was returned to EOD Mobile Unit Two to be used in the evaluation. Another RIX Conversion Kit was provided to the EOD Mobile Unit Three representative to install on a compressor at their location which would be used in the evaluation.

The EOD representatives returned to their respective commands to conduct testing in accordance with the procedures set forth in the Test Plan². Total running time was 50 hours on each compressor.

EVALUATION PROCEDURES

The compressors were set up with the conversion kits and operated for extended periods charging 2548.52 liter (90 cu ft) SCUBA cylinders from 0 to 206.84 bars (0 to 3,000 psig)⁴. Total test time was 50 hours. The testing included subjective evaluation of the pulley kit operation but did not include detailed mechanical review of the individual components of the system.

The following procedures were conducted by Fleet personnel and the results entered in the test log.

1. The sheaves were installed on the motor and compressor shafts according to RIX instructions³.

2. A torque wrench was used to calibrate the tightness of the sheave attachment bolts³. Readings were recorded in Annex 'A'.

3. A vernier caliper was used to measure the clearance from the sheave collars along the axis of the shafts to the bearing housings on both the motor and compressor. Readings were recorded in Annex 'A'.

4. The compressor was operated for one (1) hour under a no load condition.

5. Items 2. and 3. were repeated.

6. A set of 2548.52 liter (90 cu ft) SCUBA cylinders were connected to the outlet of the compressor which was used to fill the cylinders to full pressure of 206.8 bars (3,000 psig)⁴. The compressor was shut down when the system was at maximum pressure to ensure the system was not leaking and was safe to operate.

Once the system was secured, the following steps were accomplished:

1. While holding pressure, a leak check was performed of all joints under pressure using a leak detection agent.

2. Measurement detailed in items 2 and 3 above were repeated.

3. The compressor was operated as it would be during normal operations, repeating the measurements in items 2 and 3 each time the compressor was stopped. The following information was recorded on the log sheet (Annex A).

- Date
- Time
- Total test hours
- Sheave torque measurement
- Sheave clearance measurement
- Compressor discharge pressure
- Cylinder size
- Cylinder fill time
- Remarks

4. The compressor volume output was computed by charging 2548.52 liter (90 cu ft) SCUBA cylinders from 0 to 206.8 bars (0 to 3,000 psig). Charging time was logged and the charging rate calculated on Annex A

OBSERVATIONS

DELIVERY

Compressor capacity when using the pulley kit was determined to be 159.4 liters per minute (5.63 SCFM) by calculating the average of the hourly flow rates recorded in Appendix A.

MAINTENANCE

The lubricating oil was changed when 25 hours of testing had accumulated.

CONCLUSIONS AND RECOMMENDATIONS

1. The RIX Model SA-6 compressor is not adversely affected by the pulley kit. The compressor output averaged 159.4 liters per minute (5.625 SCFM) of air, per Appendix A. This exceeds the manufacturer's specification of 155.7 liters per minute (5.5 SCFM).
 2. No appreciable movement of the kit was measured during the evaluation.
 3. The kit is sturdy, reliable, readily maintained, and can be installed by Fleet personnel.
- Based on the results of testing, the RIX Model SA-6 air compressor pulley kit is recommended for inclusion on the Authorized for Navy Use List⁵.

REFERENCES

1. NAVSEA Task 95-23; *EVALUATION OF THE RIX INDUSTRIES SA-6G CONVERSION KIT*. Naval Sea Systems Command, 1995.
2. *EVALUATION OF RIX INDUSTRIES SA-6G DUAL BELT CONVERSION KIT (UNMANNED)*, NEDU TP 95-21. Navy Experimental Diving Unit, September 1995, Limited Distribution.
3. *SPECIFICATIONS FOR RIX SA-6G DUAL BELT CONVERSION KIT*. RIX Industries 6460 Hollis Street Oakland, California (ND)
4. Naval Sea Systems Command, *U.S. NAVY DIVING MANUAL*, Vol 1, Rev 3, table 5-4. NAVSEA 0994-LP-001-9010, Naval Sea Systems Command.
5. Naval Sea Systems Command, *DIVING EQUIPMENT AUTHORIZED FOR U. S. NAVY USE*. NAVSEAINST 10560.2C, Naval Sea Systems Command.

Annex 'A'
Rix SA-6G Dual Belt Conversion Kit Log Sheet

DATE	05/26/96	05/27/96	05/28/96	06/03/96	06/04/96	06/05/96	06/09/96	06/10/96
TIME	0930-1200 1315-1515	0930-1200 1300-1530	0915-1230 1330-1530	1000-1300 Air Sample	0915-1130 1300-1415	0930-1230 1300-1500	0945-1200 1300-1530	0900-1200 1300-1530
TOTAL TEST HOURS	4.5	9.5	14.25	17.25	20.75	25.75	30.5	36
SHEAVE TORQUE READING	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.
SHEAVE CLEARANCE MEASUREMENT	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"
COMPRESSOR DISCHARGE PRESSURE	3000 psig	3000 psig	3000 psig	3000 psig	3000 psig	3000 psig	3000 psig	3000 psig
CYLINDER SIZE	Twin 90's	Twin 90's	Twin 90's	Twin 90's	Twin 90's	Twin 90's	Twin 90's	Twin 90's
CYLINDER FILL TIME	32 min	32 min	32 min	32 min	32 min	32 min	32 min	32 min

REMARKS

06/06 Changed oil at 25 hours operating time.

Annex 'A'
Rix SA-6G Dual Belt Conversion Kit Log Sheet

DATE	06/15/96	06/16/96	06/17/96	06/18/96				
TIME	0930-1200	0930-1200	1000-1200	1000-1200				
TOTAL TEST HOURS	38.5	41	43	45				
SHEAVE TORQUE READING	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.	55 inch lbs. 175 inch lbs.				
SHEAVE CLEARANCE MEASUREMENT	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"	7/8 " 2 1/4"				
COMPRESSOR DISCHARGE PRESSURE	3000 psig	3000 psig	3000 psig	3000 psig				
CYLINDER SIZE	Twin 90's	Twin 90's	Twin 90's	Twin 90's				
CYLINDER FILL TIME	32 min	32 min	32 min	32 min				
REMARKS								
Average Charging Rate: $90 \text{ ft}^3 \times 2 \div 32 \text{ min} = 5.625 \text{ ft}^3 \text{ per min.}$								